5.0 CUMULATIVE IMPACTS

5.1 INTRODUCTION

The mile-deep Grand Canyon of the Colorado River in Arizona is a dramatic illustration of cumulative impacts, although in this case from natural forces (erosion occurring over six million years) rather than human causes.

In the context of the NEPA and EISs, the Council on Environmental Quality's (CEQ) Regulations (40 CFR 1500-1508) implementing the procedural provisions of NEPA, as amended (42 USC 4321 et seq.), define cumulative effects as:

> the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other action. (40 CFR 1508.7)

Cumulative effects may be adverse, beneficial, or both.

Incorporating the principles of cumulative effects analysis into the environmental impact assessment of a proposed action should address the following:

- Past, present, and future actions;
- Other Federal, non-Federal, and private actions;
- Impacts on each affected resource, ecosystem, and human community; and
- Truly meaningful effects.

MEPA has a somewhat narrower requirement for considering cumulative impacts of proposed actions, as stated in Section 75-1-208, MCA:

> (11) An agency shall, when appropriate, consider the cumulative impacts of a proposed project. However, related future actions may only be considered when these actions are under concurrent consideration by any agency through preimpact statement studies, separate impact statement evaluations, or permit processing procedures.

Because the federal requirement for analyzing cumulative impacts is broader, this EIS will follow those guidelines, which call for the inclusion of future non-Federal and private actions in the cumulative impacts analysis, and not only those actions currently under consideration by an agency in permitting procedures or other environmental reviews.

In analyzing cumulative impacts, spatial and temporal boundaries must be selected. These form the context of the cumulative analysis. Judgment should be used in choosing the most appropriate boundaries to meaningfully assess the role of the proposed action, secondary actions

and connected actions in comparison with overall effects from all past, present and future actions. If spatial and temporal boundaries are set too narrow, this will tend to overstate the relative importance of the proposed action compared with others, but perhaps reduce the overall cumulative scale of impacts to a misleadingly small magnitude. For example, with regard to some aspects of air quality (e.g. long range atmospheric transport of the acid rain precursors sulfur dioxide and nitrogen oxides), using the subject county's or even state's boundaries could amplify the role of a given project's emissions, while simultaneously diminishing the overall scale of the acid rain issue by artificially confining it to an area where it is not especially problematic.

In contrast, if spatial and temporal boundaries are set too broad, the contribution of the proposed action to cumulative impacts will be unduly small in comparison with the contributions of all other actions, but the overall scale of cumulative effects may be enormous and exaggerated. Consider the example of a proposed action that in conjunction with all others was predicted to lead cumulatively to the extinction of a given species. If a cumulative impacts analysis considered this phenomenon in the context of a geologic time scale measured in millions of years, during which time a number of species could disappear while new ones evolved, such an analysis would improperly diminish the significance of cumulative impacts leading to the permanent extinction of the species in question.

Ideally, natural boundaries should be used, but sometimes institutional or geographic boundaries are relevant as well, especially when certain key impacts weigh as much on the human environment as the natural environment. Spatial boundaries may also vary by resource topic. In the present cumulative analysis, Cascade County's boundaries may be the most appropriate for some resource topics, the state of Montana's the most appropriate for others, and the nearest reaches of the Missouri River for still others. However, a number of impacts to which the proposed action and secondary and connected actions contribute incrementally are much further away, much larger, or widely dispersed: the entire downstream length and watershed of the Missouri River, airsheds over the Rocky Mountains and Northern Midwest, the earth's atmosphere, and so forth.

In terms of temporal bounds for the cumulative analysis, a case can be made for starting with the post-World War II era, especially the 1950s, when the Great Falls area experienced substantial growth and development concurrent with the expansion of Malmstrom Air Force Base. Montana's population grew rapidly in the 1950s as well. The endpoint for the cumulative analysis could be set at 2040 – toward the end of the approximate design lifetime (thirty years plus) of the proposed HGS. However, any such fixed temporal boundary cannot help but be arbitrary, and thus the future boundary of cumulative impacts likewise varies by resource. The time frame of at least one potential cumulative impact – possible global climate change from anthropogenic (human) emissions of greenhouse gases like carbon dioxide and nitrous oxide and their accumulation in the earth's atmosphere – extends centuries into the future.

Chapters 3 and 4 examined the affected environment and environmental consequences of the no action, proposed action, and alternate site alternatives with regard to 15 resource areas. Of these, only those resource areas impacted by one or more of these alternatives to a more than negligible

extent, and other past, present, and reasonably foreseeable future actions, are included in the cumulative analysis.

Those resource topics for which the No Action alternative, Proposed Action, and/or alternate site were considered to have more than a negligible beneficial or adverse, direct or indirect, impact (and therefore possible additive effects with other actions) are shown in the following table. The alternative (#1 – No Action, #2 – Proposed Action, #3 – Alternate Site) or alternatives that are responsible for an identified adverse or beneficial impact are shown in parentheses.

Table 5-1. Summary of Direct and Indirect Impacts from No Action (#1), Proposed Action (#2), and/or Alternate Site (#3) Alternatives

Resource topic	Adverse impacts	Beneficial impacts
Soils, Topography, and Geology	• Negligible to minor, long-term adverse impacts (primarily erosion and loss of soil fertility) would continue from existing land use practices such as from grazing, tilling, disking, plowing, and movement of farm machinery (#1). • Extensive site grading and excavation activities that would disturb a considerable amount of soil and alter topographic contours (#2 & #3). • Soil resource impacts from construction activities would have a moderate magnitude, medium-term duration, and medium extent (#2 & #3). • Due to the operation of the waste monofill for the duration of the plant's life, operation-related impacts on soil resources would be minor magnitude, long-term duration, and small extent (#2). • Permanent increase in impermeable surface area and the risk associated with soil contamination from site runoff or leachate (#2 & #3).	
Water Resources	• Negligible to minor, long-term adverse impacts on receiving water quality would continue	

Water Resources (cont.)	from existing land uses – runoff from agricultural lands can carry sediments, nutrients and other pollutants (#1). • Site construction would involve negligible to minor impacts on receiving water quality from increased storm water runoff and possible contamination (#2 & #3). • Negligible to minor impacts on Missouri River flows from water withdrawals and consumptive use (#2 & #3).	
Air Quality	• Exhaust emissions from equipment used in construction, coupled with likely fugitive dust emissions, could cause minor to moderate, short-term, localized degradation of local air quality (#2 & #3). • Coal-fired power plant would release nitrogen oxides, sulfur dioxide, particulate matter, carbon monoxide, volatile organic compounds, carbon dioxide, lead, and mercury (all). • Long-term minor to moderate degradation of local air quality from operations (all). • Long-term minor impacts on sensitive species from criteria pollutant emissions and/or trace element deposition (#2 & #3). • Short-term/long-term direct minor adverse impact on applicable PSD Class I increments (all). • Direct minor adverse impact on visual plume (#2 & #3) • Direct long-term minor adverse impact on acid deposition (all) • Direct short-term minor adverse impact on regional haze (all) • Negligible to minor emissions of mercury (all) • Negligible to minor emissions of greenhouses gases (mainly carbon dioxide) (all)	

Biological Resources	• Short-term impact to wildlife/vegetation by degrading air quality (#2 & #3). • Short-term impact to aquatic biota from degraded water quality (#2 and #3). • Long-term increase in mortality of terrestrial mammals by rail strikes and increased traffic on access road (#2 & #3).	
Noise	• Minor to moderate, short-term adverse impacts from intermittent noise during construction, both from equipment at site and transit of city and county streets by workers and equipment (#2 & #3). • Minor long-term impacts from increased noise along route of train carrying coal to power plant (#2 & #3). • Long-term impact of noise from coal plant operation on receptors would be negligible to minor (#2 & #3).	
Recreation	• Negligible to at most minor impacts on recreation in the immediate project vicinity and wider Great Falls area (#2 & #3).	
Cultural Resources	• Major, long-term impact on existing Great Falls Portage National Historic Landmark because of large, salient facility inserted into landscape relatively unchanged since 1980s listing and reminiscent of that which Corps of Discovery observed (#2).	

Visual Resources	• Scenic impacts on NHL of major magnitude, long-term duration, and small extent (#2). • Scenic impacts of moderate magnitude, long-term duration, medium or localized extent (#3).	
Transportation	• Construction-related impacts on road traffic would be of minor magnitude, medium-term duration, and small extent (#2 & #3). • Minor, temporary construction-related impacts on rail transport on the BNSF line to which a rail spur would connect (#2 & #3).	
Farmland and Land Use	• Conversion of farmland would have impacts of minor magnitude, long-term (permanent) duration, and medium extent (#2 & #3). • Impact on land use (property values) from the operation of a power plant at Salem would be of moderate magnitude, long-term duration, medium to large extent, and possible likelihood (#2). • Impacts on land use from the operation of a power plant at the Industrial Park Site would be minor magnitude, long-term duration, medium extent, and possible likelihood (#3).	
Waste Management	• Construction impacts on waste management would be of minor magnitude, medium-term duration, and small extent (#2 & #3). • Operation-related impacts on waste management for the	

Waste Management (cont.)	Salem Site would be of moderate magnitude, long-term duration, and medium extent (#2). • Operation-related impacts on waste management for the Industrial Site would be of minor to moderate magnitude, long-term duration, and small extent (#3).	
Human Health and Safety	• Construction-related impacts on human health and safety would be of minor magnitude, medium-term duration, and small extent (#2 & #3). • Operation-related impacts on human health and safety would be of minor magnitude, long-term duration, and medium extent (#2 & #3).	
Socioeconomics	• Socioeconomic impacts from potentially higher electric rates would be of minor magnitude, long-term duration, and medium extent (#1).	• During construction phase, moderately beneficial effect on the socioeconomic environment of the local and regional area, including increases in employment opportunities, total purchases of goods and services, and an increase in the tax base (#2 & #3). • During operation phase, beneficial socioeconomic impacts would be of minor magnitude, long-term duration and medium extent (#2).
Environmental Justice and Protection of Children	• Impact on low-income residents of potentially higher electrical rates would be of moderate magnitude, intermittent-term duration, small extent, and possible likelihood (#1). • Impacts of plant operation on low income residents would be of minor to moderate	

Environmental Justice and Protection of Children (cont.)	magnitude, long-term duration, medium extent, and unlikely likelihood (#3).	

5.2 PAST, PRESENT, AND "REASONABLY FORESEEABLE" FUTURE ACTIONS

This section reviews relevant actions and trends that have already occurred, are underway at present, or may possibly occur in the future that may cumulatively interact with the No Action, Proposed Action (Salem site), and Alternate Site Alternatives (Industrial Park site).

5.2.1 PAST AND PRESENT ACTIONS AND TRENDS

- Montana Pollutant Discharge Elimination System (MPDES) Permits: A total of 35 MDPES permits have been issued by DEQ within a 10-mi radius of Great Falls, MT. Three of these are municipal permits for Great Falls and Sun Prairie Village wastewater treatment, one is an industrial permit, two are concentrated animal feeding operations (livestock feedlots), and the rest cover storm water discharges. In most instances, the receiving water is the Missouri River (DEQ, 2005b).

  These discharges, plus numerous other point and non-point discharges upstream, have led to the "impaired" status of the Missouri River discussed in Section 3.2.4 of this EIS. The river is listed as not supporting the beneficial uses of aquatic life, coldwater fishery, warm water fishery, and drinking water. Probable causes of the river impairment include PCBs, metals, siltation, turbidity, and thermal modifications. Probable sources of the impairment are listed as being industrial point sources, dam construction, hydro-modification, and agriculture.

- Great Falls Industrial Park Development: In September 2005, the International Malting Company (IMC) began production at a $60-75 million malt plant with 35 employees and an annual payroll more than $2.3 million in the Industrial Park ("Agri-Business Park") north of Great Falls (Larcombe, 2005). Touted as the most automated malting plant in the world (GFDA, no date), the IMC plant is to have an annual malt production of 12 million bushels, which would require 11 million bushels of malting barley from producers each year (Kramer and Owen, 2003). The City of Great Falls intends to extend sewer service to the IMC plant and plans to co-generate electricity at its existing wastewater treatment plant (Wilmot, 2005a). In addition, the City will sell 432,033 gallons per day of untreated Missouri River water to the IMC plant (Wilmot, 2005b).

- Coal-fired Power Plants: As of August 2004, Montana had five large generating stations using sub-bituminous coal as a fuel source: J.E. Corette in Yellowstone County (163 MW; opened 1968) and the four Colstrip plants in Rosebud County (348 MW, 358 MW, 778 MW, 778 MW; opened in 1975, 1976, 1984, and 1986, respectively). Each of these plants is a pulverized coal facility, and as such, emits criteria pollutants and other

contaminants such as HAPs like mercury in amounts controlled by air pollution control technologies installed under authority of the federal Clean Air Act and the Montana SIP.

- Acid Deposition Effects on pH: In the latter half of the 20th century, acid deposition has impaired water quality and damaged aquatic life in thousands of small and large water bodies in North America – including ponds, lakes, streams and rivers – particularly in the Eastern and Upper Midwestern United States and Canada (EPA, 2003e). Especially vulnerable have been regions underlain by the poorly-buffered, ancient rocks of the Canadian Shield, or by other rock formations low in buffering capacity, that is, the ability to neutralize acidic inputs from rainfall and snowmelt. As the pH of these water bodies fell below 5.0 (neutral pH is 7.0, and 5.0 is 100 times as acidic as 7.0), populations of aquatic invertebrates and fish declined in tandem, disappearing almost entirely in the lowest pH systems and suffering severe reductions in others. In the West, acidification of water bodies has been much less problematic than in the East and Upper Midwest, due to several factors such as better buffered parent rocks and fewer overall SO_2 emissions.

  The Clean Air Act Amendments of 1990 and subsequent regulations addressed emissions of sulfur dioxide that are the major cause of acid rain and began the process of reducing these emissions nationally. They set a goal of cutting sulfur dioxide emissions in half. Emissions of both sulfur dioxide and nitrogen oxides have begun to decline, as has acid deposition in watersheds, but recovery of aquatic ecosystems is still in its incipient stages and may well take decades.

- Acid Precipitation and Forests: Acid rain can cause slower growth, injury, and in worst cases, the death of forests. It has been implicated in forest and soil degradation in many areas of the eastern U.S., especially in high elevation forests of the Appalachian Mountains from Maine to Georgia. In most cases, it appears that the combination of acid rain and other environmental stressors is responsible for declining forest health (EPA, 2003k).

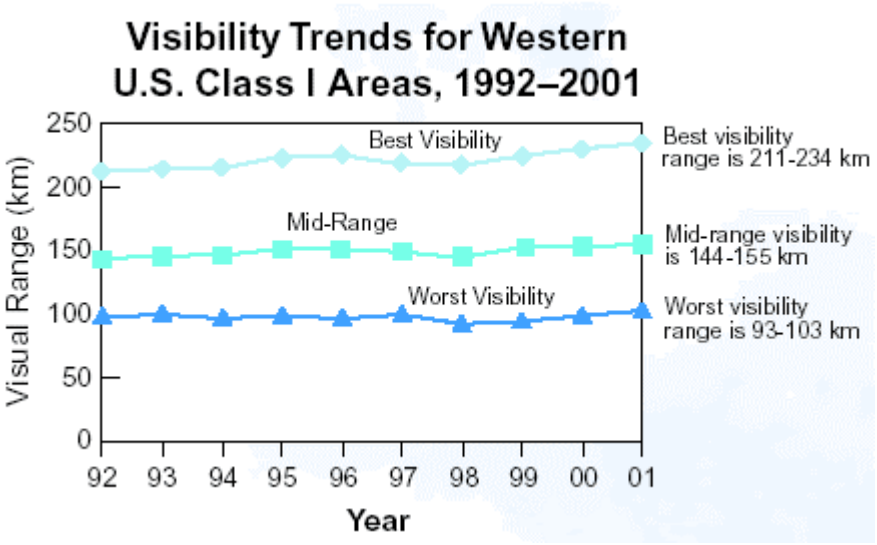
- Acid Precipitation and Manmade Structures: Acid rain can also damage materials such as bronze, marble and limestone, leading to deterioration of cultural artifacts like statues made of these materials (EPA, 2003l). This problem has been documented in the East and in Europe much more than in the American West.

- Fossil Fuel Emissions and Visibility Reduction: In the latter half of the 20th century, as the U.S. population and economy grew to unprecedented levels, overall fossil fuel combustion roughly tripled to meet the rising energy consumption this growth entailed. Coal consumption alone quadrupled from 1950 to 2000 (EIA, 2001). Particulates and sulfur dioxide emitted to the air from burning coal are a dominant factor in the regional haze and associated visibility reduction that have compromised scenery in extensive areas of the country (NPS, 1997; Malm, 1999; EPA, 2003j). In Shenandoah National Park for example, located in Virginia's picturesque Blue Ridge Mountains, scientists estimate that the average visibility within the park has decreased from about 65 miles at the beginning of the 20th century to 15 miles toward the end of the 20th century (Connors, 1988). Sulfur dioxide particles or aerosols are not the sole cause of this, but they are the

principal one, especially in the East, where SO_2 is estimated to cause some 60-90 percent of visibility reduction (Malm, 1999). In the West, sulfates are estimated to cause 25-50 percent of the problem (EPA, 2005g). EPA concludes that overall, the visual range in our nation's scenic areas has been substantially reduced by air pollution. In eastern parks, average visual range has decreased from 90 miles to 15-25 miles, while in the West, visual range has decreased from 140 miles to 35-90 miles (EPA, 2005e).

Montana's Glacier National Park has been monitoring visibility since 1982 as part of a continuous nationwide monitoring program network called IMPROVE (Interagency Monitoring of Protected Visual Environments). At Glacier NP, visibility is greater than 200 miles less than 1% of the time, between 135-220 miles 10-25% of the time, 80-105 miles 40-60% of the time, 40-60 miles 10-25% of the time, and less than 10 miles less than 1% of the time (GNP, no date). In 1997, on the worst visibility days in the national park, the contributions to visibility reduction from various pollutants were as follows: sulfates (37%), organic carbon (32%), crustal material (11%), elemental carbon (10%) and nitrates (10%) (EPA, 2005f). The percentages of pollutants impairing views at Yellowstone National Park are fairly similar. According to visibility monitoring, the visual range at both these parks improved slightly during the decade of measurements between 1988 and 1997 (EPA, 2005f). In the West as a whole, visibility in Class I areas remained relatively unchanged between 1992 and 2001 (Figure 5-1) (EPA, 2005g).

Figure 5-1



Source: EPA, 2005g

- Mercury Contamination: An extensive discussion of mercury emissions, deposition, pathways, transformation into methylmercury, neurotoxicity and potential ecological effects is contained in Chapter 3 of this EIS (Section 3.3.4) and will not be repeated here. To briefly summarize, mercury levels in the biosphere have increased by several factors in the past few centuries over natural background levels as a result of increasing industrial and domestic use of this versatile liquid metal, burning coal in power plants,

and incinerating medical and municipal waste. As elemental mercury vapor, this toxin is transported through the atmosphere all over the world, so that it is truly a global problem. U.S. emissions, which were reduced roughly in half (from 221 to 112 tons) between 1990 and 1999 now comprise an estimated three percent of global mercury emissions. Coal-burning power plants are now the main remaining emitter of mercury in the U.S. A majority of the mercury deposition in the U.S. is believed by scientists to originate outside of North America, mostly in Asia. However, the nature and extent of local deposition creating possible "hot spots" of mercury from coal-burning power plants continues to be studied.

The main concern about mercury's health effects on humans and wildlife revolves around the consumption of fish that contain the compound methylmercury. Montana is one of a number of states with consumption advisories on fish containing methylmercury and other toxins caught in certain water bodies in the state. The advisories are designed to protect especially vulnerable segments of the public (in particular, pregnant women and young children) from the potentially toxic effects of excessive mercury ingestion through eating fish. While the number of fish consumption advisories has been increasing throughout the country in recent years, this may reflect more an increasing awareness and documentation of the widespread extent of mercury contamination rather than an actual increase in the level of contamination.

- Global Climate Change: Rising fossil fuel combustion and clearing of forests worldwide have released CO_2, the main "greenhouse gas," at a rate greater than the biosphere's ability to fix or sequester this gas. As a result, carbon dioxide concentrations in the atmosphere have risen from 316 parts per million (ppm) in 1959, when measurements began in Hawaii, to 376 ppm by the year 2003 (Keeling and Whorf, 2004). These concentrations continue to climb in spite of tentative initial international efforts to address the issue begun in Kyoto, Japan in 1997. Although there is uncertainty and disagreement about the details, there is broad consensus among climatologists and atmospheric scientists at the Intergovernmental Panel on Climate Change (IPCC) that rising concentrations of CO_2 will generally warm and change the climate globally. Some scientists dissent from this majority view.

  Global temperatures are rising even now: global mean surface temperatures have increased 0.5-1.0° F since the late 19th century (EPA, 2000c). Among the predictions (with varying degrees of confidence) are substantial variation in the degree of warming from the poles (most warming) to the tropics (least warming), altered precipitation patterns, and an increase in the intensity, if not the frequency, of extreme weather events such as storms, floods, hurricanes, and tornadoes. If Global Circulation Models are correct, global climate change also poses many ramifications for natural ecosystems, agriculture, and human health, and societies and economies generally.

- Missouri River Flows: Like many Western rivers, controversy surrounds management of flows in the Missouri River, in this case by the Army Corps of Engineers. In the case of the Missouri, unlike the Rio Grande, Colorado, and Platte rivers, this controversy has less to do with overall flow depletions from consumptive water use within the basin than with

the seasonal regulation of discharge through the dams and reservoirs along the river in Montana, North Dakota and South Dakota and the different, competing needs of navigation, recreation, and wildlife interests. Figure 5-2 shows Missouri River annual runoff downstream of Montana (at Sioux City, Iowa) during the 20th century.

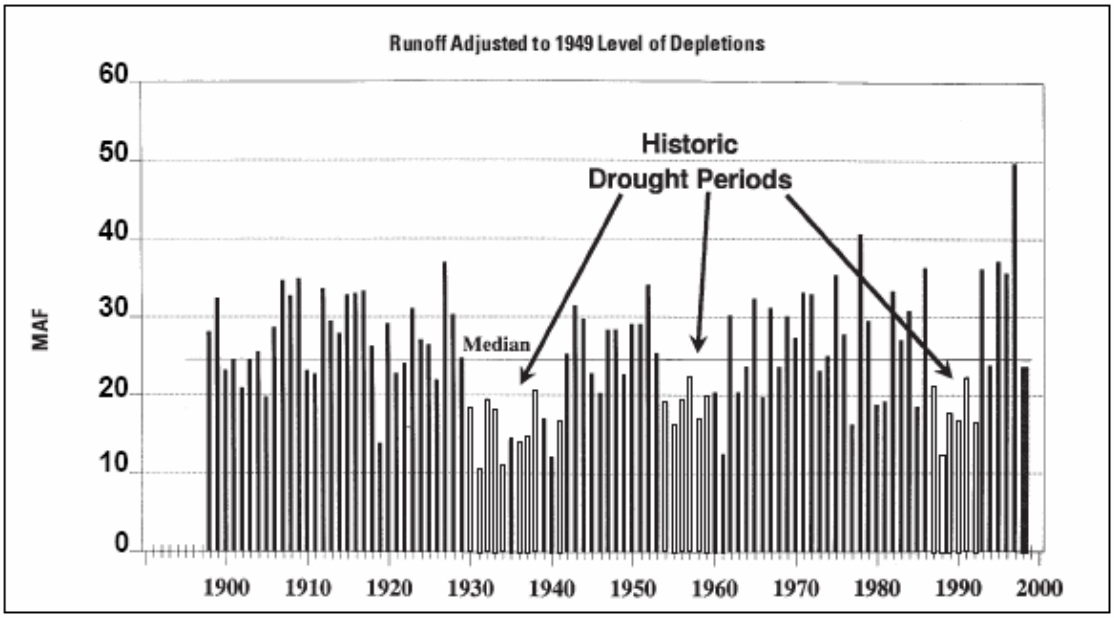


Figure 5-2. Missouri River – Annual Runoff (Million Acre-Feet) at Sioux City, Iowa
Source: USACE, 2004b

5.2.2 REASONABLY FORESEEABLE FUTURE ACTIONS AND TRENDS

- Proposed Transmission Line to Great Falls: The Montana Alberta Tie Ltd. (MATL) is proposing to construct, operate and maintain a 230-kilovolt electric transmission line on private land and State of Montana School Trust Lands between Lethbridge, Alberta and Great Falls, Montana (DEQ, 2005c). This approximately 190-mile line would connect the Alberta Interconnected Electrical System operated by the Alberta Electric System Operator (AESO), and Northwestern Energy's (NWE's) transmission system at the 230-kV substation just north of Great Falls (MATL, 2005).

  This project would be the first power transmission interconnection between the U.S. and Alberta; it is expected to facilitate development of additional generation sources (e.g., windfarms both in northern Montana and southern Alberta), as well as improve transmission system reliability in Montana, Alberta, and on a regional basis in both the United States and Canada.

  MATL's Major Facilities Siting Act (MFSA) application predicts impacts to physical resources such as geology and soils, air, and water, biological resources such as vegetation, wetlands, wildlife and fisheries, and sensitive (listed and proposed) species, and social resources such as socioeconomics, land use, utilities and transportation, visual resources, human health, recreation, cultural resources, and environmental justice. Most

adverse effects identified are expected to be minor. The application also identifies potential cumulative impacts in the general Alberta-Montana corridor through which the proposed 230 kV transmission line would pass. Two of the highlighted biological cumulative impacts include the dispersion of noxious weeds along pipeline and transmission line right-of-ways and the potential for increased mortality of birds and/or bats from the growth of wind turbine facilities (MATL, 2005).

Missouri River Flows: In the basin as a whole, depletions from diversions for water supply and irrigation have become a factor in overall basin runoff and will be even more so in the future, especially as American Indian Tribes in the Missouri River basin begin to exercise their Tribal water rights (USACE, 2004).

- Proposed Coal-fired Power Plants: At present, at least four other coal-fired power plants in Montana are conceptualized or proposed, have received permits, or are under construction. These include Roundup Power Project near Roundup (780 MW – a conventional pulverized coal plant), Rocky Mountain Power near Hardin (160 MW – pulverized coal), Great Northern Power Nelson Creek Project near Circle (560 MW – CFB plus wind power), and Otter Creek Power Project near Decker (3,000 MW – type undetermined) (WRA, no date). Thompson River Cogeneration near Thompson Falls (16.5 MW – coal and wood waste) has been constructed and operated for a short time but was not operating as of May 2006. Potential air quality impacts (especially reduced visibility) of the proposed Roundup plant in particular have generated concerns among the federal land managers, particularly the National Park Service and U.S. Fish and Wildlife Service, and have led to legal actions by environmental groups and initiation of a Clean Air Act dispute resolution process by the Northern Cheyenne Tribe. DEQ conducted an EIS on the Roundup plant, issued a Record of Decision in January 2003, and issued an air quality permit (DEQ, 2003). This permit is being challenged in administrative and judicial legal actions by environmental groups.

- Emissions and Visibility: While visibility impairment from sulfur dioxide aerosols and particulates remains a serious problem in scenic areas across much of the country, the fact that SO_2 emissions have now begun to decline promises that in the coming years the situation will improve (EPA, 2003j). For example, EPA estimates that its Acid Rain Program will improve the visual range (how far a viewer can see) in the eastern U.S. by 30 percent. This will be an especially welcome benefit for visitors to national parks and other natural areas celebrated for their scenic grandeur.

  In Section 4.5.2.2.3, the regional haze analyses for both the proposed source only and the cumulative sources indicated that the HGS would not cause an adverse regional haze impact in the Class I areas of interest and that the impacts would be minor to moderate. P. 82 of the draft air quality permit (Appendix I of this EIS) states that modeling predicts four days over 10 percent cumulative impact. However, this cumulative analysis includes only the existing emissions sources along with the HGS, not all potential future sources such as the coal-fired power plants cited above, as well as others that may follow over the longer term (but still within the likely 30-50 year project life of the HGS) if demand for electricity continues to grow in the West and lower-emission generation options like

natural gas become more expensive, scarce, and less viable. At the same time, newer and future coal-fired thermal electric plants, some of which are replacing older, dirtier units, are being subjected to ever more stringent air pollution controls to comply with federal and state regulations. These two contradictory trends – increasing combustion of fossil fuels and tighter pollution controls – will certainly offset one another, but it is difficult to predict the net changes in total emissions and air quality that will occur in the Northern Rockies.

- "Clean Coal" Technology: The State of Montana is offering tax breaks and loan guarantees to private-sector partners which would develop coal gasification technology and build one or more plants in Montana to convert the state's coal reserves into liquid fuel and diesel (Montana Governor's Office, no date).

- Mercury Emissions: Mercury emissions from coal-burning power plants are in the process of being regulated both federally (e.g. Clean Air Mercury Rule of 2005) and under Montana rules by the Board of Environmental Review and DEQ. EPA's Utility Mercury Reductions would reduce total coal-fired power plant mercury emissions by nearly 70 percent if fully implemented (EPA, 2004f) but environmentalists are continuing to advocate for 90 percent emission control, which would result in greater reductions at individual plants. Montana's draft mercury rules would be more stringent than the CAMR, eventually limiting all coal-fired generating stations in the state to no more than 0.9 pound of mercury per trillion Btu heat input.

- Montana Farmland: Between 1982 and 1997, total cropland acreage in Montana declined from approximately 17.2 million acres to 15.2 million acres, a decline of nearly 12 percent. However, much of this acreage was marginal cropland at least temporarily retired under the federal Conservation Reserve Program (CRP), which rose from zero acres to 2.7 million acres in Montana over the same period. Over the same 15-year interval, pastureland increased from 3.1 to 3.4 million acres and rangeland decreased slightly from 37.8 to 36.7 million acres (NRCS, 2000). Thus total agricultural lands including CRP lands decreased marginally from 58,098,000 acres to 58,085,000 acres between 1982 and 1997, an insignificant change. Developed land in the state increased slightly from 878,600 acres to 1,032,300 acres, which would have converted land from both agricultural and forested land uses to built-up (residential, commercial, agricultural, transportation) uses.

- Carbon Dioxide Emissions and Global Climate Change: The United States Senate declined to ratify and the current administration formally withdrew from the Kyoto climate change pact that the U.S. and many other countries signed in 1997 in Japan. That would have committed the United States to reducing its aggregate CO_2 emissions to nine percent below its 1990 emissions by the year 2012. Instead, national emissions continue to grow unabated – greenhouse gas emissions in 2002 were 11.5 percent higher than 1990 emissions (EIA, 2003). Globally, the rate of CO_2 accumulation in the atmosphere appears to be accelerating. While there is still some uncertainty and scientific dissent, most scientists anticipate that average global surface temperature could rise 1 to 4.5° F (0.6 to 2.5° C) over the next fifty years, and 2.2 to10° F (1.4 to 5.8° C) in the coming

century, with significant regional variation (EPA, 2000c). Strong economic growth in populous developing countries like China and India, which were exempted from making any cuts in national emissions at the Kyoto negotiations because of their poverty and low per capita CO_2 emissions, dims the prospects for reducing combined international emissions of the main greenhouse gas anytime soon. Nevertheless, over the 30 to 50-year lifetime of the proposed HGS coal-fired power plant, it could well be subjected to requirements aimed at regulating its carbon dioxide output.

- Growth of Wind Energy: As discussed in Chapter 2 of this EIS, projects to capture wind energy with turbines and generate electricity are expanding rapidly throughout the United States. Montana itself has several recently completed or proposed wind projects. While newer, larger wind turbine designs with more slowly rotating blades have reduced mortality of wildlife principally in the form of collision by birds and bats, some mortality still occurs. Because wind turbine farms are still relatively new, the science of evaluating bird and bat strikes and devising avoidance and mitigation measures is still advancing. In its 2003 guidance, the U.S. Fish and Wildlife Service stated that it was still too early to reach definitive conclusions on the potential extent of cumulative impacts on given bird and bat species and populations around the country.

5.3 NO ACTION ALTERNATIVE

Under this alternative, no HGS would be constructed at either the Salem or Industrial Park sites. As its contract with BPA begins to be phased out, it is assumed that SME would purchase the electricity it needs to supply its member systems on the open, deregulated power market. In purchasing electrical energy from a possible variety of wholesale electricity suppliers in the region, SME would be contributing indirectly and incrementally to cumulative environmental impacts associated with the generation of electricity from various fuel/energy sources, possibly including natural gas, coal, nuclear, hydro, and to a smaller extent, wind and other renewables. Thus, while there would be no contribution to cumulative impacts at the local and regional scales from construction and operation of a facility at either site, SME's contribution to cumulative impacts at the regional, national, and global scales – while impossible to isolate and quantify – would not be trivial. If the major source of generation were other coal-fired power plants, SME's contributions to cumulative impacts would be roughly on a par, or greater in the case of older facilities, with those from construction of HGS. Given power generation trends in the region, coal would likely become the dominant energy source as the decades proceed.

5.4 PROPOSED ACTION – HGS AT THE SALEM SITE

The Proposed Action would contribute to certain cumulative impacts, which are discussed briefly below and presented in Table 5-3.

Soils, Topography, and Geology – Extensive site grading and excavation activities would disturb a considerable amount of soil and alter topographic contours at the Salem site, and overall, soil resource impacts from construction activities would have a moderate magnitude, medium-term

Table 5-2. Summary of the Potential Long-term Cumulative Impacts from the No Action Alternative

Resource topic	No Action Alternative	Other Past, Present and Future Actions	Cumulative Impacts
Soils, Topography, and Geology	*	*	*
Water Resources	*	**	**
Air Quality	*	**	**
Socioeconomics	**	*	*
Environmental Justice	**	*	*

Key:
Adverse: * Minor Impact ** Moderate Impact *** Major Impact
Beneficial: + Minor Impact ++ Moderate Impact +++ Major Impact
No Impact: 0

Impact Intensity Definitions:
Minor – Change in a resource area occurs, but no substantial resource impact results.
Moderate – Noticeable change in a resource occurs, but the integrity of the resource remains intact.
Major – Substantial impact/change in a resource area that is easily defined, noticeable & measurable.

duration, and medium extent. Impacts from operation of the waste monofill for the duration of the plant's life on soil resources would be minor magnitude, long-term duration, and small extent. Combined with other construction activities in the Great Falls area and Cascade County, plus general long-term degradation of agricultural lands from water and wind erosion (offset somewhat by setting aside CRP lands) and gradual loss of soil fertility, there would be an overall minor adverse cumulative impacts on soils from the Proposed Action and connected actions like pipeline and transmission line construction.

Water Resources – Site construction would involve negligible to minor impacts on receiving water quality from increased storm water runoff and possible contamination. Over the long term, there would be negligible to minor impacts on Missouri River flows from water withdrawals and consumptive use. Basin-wide water quality and quantity (seasonal flows downstream) on the Missouri will likely continue to be problems in the future, and by using water consumptively, the Proposed Action would contribute incrementally to a negligible to minor degree toward these continuing, cumulative adverse effects. Figure 5-3 shows that HGS water withdrawals would amount to 0.13 percent of the lowest mean monthly flow of record (September).

By releasing some quantity of sulfur dioxide to the atmosphere, any new coal-fired power plant would also contribute incrementally to total national SO_2 emissions, and possibly, significant cumulative impacts on the water quality of the nation's water bodies from acid deposition. However, the distance of HGS from areas of the country and continent where acidification is a

Table 5-3. Summary of the Potential Long-term Cumulative Impacts to which the Proposed Action would Contribute Incrementally

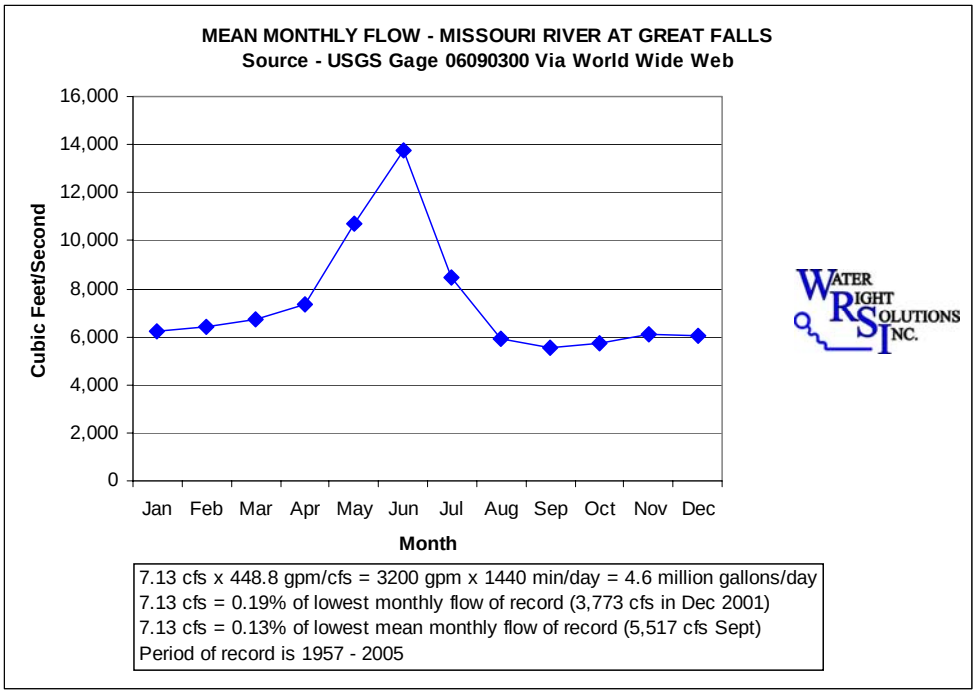
Resource topic	Proposed Action	Other Past, Present and Future Actions	Cumulative Impacts
Soils, Topography, and Geology	*	*	*
Water Resources	*	**	**
Air Quality	*	**	**
Biological Resources	*	*	*
Noise	*	*	*
Recreation	*	*	*
Cultural Resources	**	*	**
Visual Resources	**	**	**
Transportation	*	*	*
Farmland and Land Use	*	*	*
Waste Management	**	*	**
Human Health & Safety	*	*	*
Socioeconomics	++	+	+

Key:
Adverse: * Minor Impact ** Moderate Impact *** Major Impact
Beneficial: + Minor Impact ++ Moderate Impact +++ Major Impact
No Impact: 0

Impact Intensity Definitions:
Minor – Change in a resource area occurs, but no substantial resource impact results.
Moderate – Noticeable change in a resource occurs, but the integrity of the resource remains intact.
Major – Substantial impact/change in a resource area that is easily defined, noticeable & measurable.

serious problem, primarily poorly buffered Canadian Shield parent rocks/soils of the Upper Midwest and Northeast – may mean that its SO_2 emissions have limited or negligible impacts on these vulnerable areas. While innovative regulatory tools (cap and trade program) and control technology under the Clean Air Act Amendments of 1990 have made substantial strides in reducing SO_2 emissions nationwide, the significant impacts (e.g. acidified lakes and streams and stressed or eliminated aquatic life, including fish) largely continue to this day and will probably continue for some years to come.

Figure 5-3. Average Flows of the Missouri River at Great Falls, 1957-2005



Source: WRSI, 2006

Air Quality – CFB technology and BACT controls would reduce potential air emissions of all criteria pollutants and HAPs, so that the HGS would not, in and of itself, generate significantly adverse impacts on local and regional air quality. DEQ Air Quality Permit conditions would be set so as to prevent the region from being pushed into non-attainment of the NAAQS and MAAQS. Nevertheless, some minor to moderate degradation of ambient air quality would likely occur, and with increasing overall emissions in Montana and neighboring states from a variety of sources, including new and proposed coal-burning power stations, cumulative impacts over the coming decades could become significant.

With air quality more than any other individual resource topic covered in this EIS, potential cumulative impacts from a large number of mobile and stationary sources across a wide geographic domain are the major issue. An HGS plant would contribute incrementally to a minor or moderate extent toward cumulative impacts related to regional haze, visibility impairment in Class I areas, mercury dispersion and bioaccumulation, and global climate change.

Biological Resources – The Proposed Action would likely lead to short-term impacts to wildlife and vegetation by degrading air quality as well as to aquatic biota from degraded water quality. There would also likely be a long-term increase in mortality of terrestrial mammals by rail strikes and increased traffic on the access road. In a cumulative context, these would be considered minor incremental adverse impacts on biological resources. If wind turbines are erected at the Salem site, there would be some, still unquantifiable, potential for mortality to birds (primarily raptors) and bats. However, it appears that most bird and bat mortality to date has been from smaller turbines with faster-rotating (higher RPM) blades; larger turbines with

larger, lower RPM blades tend to be less problematic. Overall cumulative impacts would likely be adverse but minor. However, given the rapid growth of the wind industry in this region of the country, long-term monitoring will be necessary to gauge its cumulative impact on bird and bat populations, if any.

Noise – The HGS would cause minor to moderate, short-term adverse impacts from intermittent noise during construction, both from equipment at site and transit of city and county streets by workers and equipment. The HGS would also entail minor long-term impacts from increased noise along route of train carrying coal to power plant. The overall, long-term impact of noise from coal plant operation on receptors would be negligible to minor. There are no other planned, proposed, or likely facilities in the vicinity of the Salem site that would add to noise from the Proposed Action; therefore, cumulative impacts would be equal to the direct and indirect impacts from the HGS, which are at most minor.

Recreation – The Proposed Action would cause negligible to at most minor impacts on recreation in the immediate project vicinity and wider Great Falls area. There are no other past, present, or future planned projects in the area that would adversely impact recreation, so that cumulative impacts would be equal to the direct and indirect impacts from the HGS, which are at most minor.

Cultural Resources – There would be a major long-term impact on the existing Great Falls Portage National Historic Landmark because of the salience or visual incongruity of this large industrial facility – both the power plant and the wind turbines – being inserted into relatively unchanged, rural landscape. However, not all of the viewshed would be adversely affected, and proposed mitigation measures may offset impacts. The Lewis and Clark Interpretive Center in Great Falls, a U.S. Forest Service interpretive facility, commemorates the entire expedition, and particularly the Great Falls portage. No other large, visually obtrusive facilities are known to be proposed for construction in or close to the NHL. Overall, the cumulative impact on cultural resources would be the same as that of the Proposed Action alone – adverse and moderately significant.

Visual Resources – The proposed HGS and wind turbines would entail scenic impacts on the NHL of major magnitude, long-term duration, and small extent, because of the placement of a visually incongruous, industrial element into a rural landscape dominated not by human structures but by natural landforms and vegetation (both natural and cultivated). Overall, the cumulative impact on visual resources would equal that of the Proposed Action alone – adverse and moderately significant.

Transportation – Construction-related impacts on road traffic would be of minor magnitude, medium-term duration, and small extent. There would also be minor, temporary construction-related impacts on rail transport on the BNSF line to which a rail spur would connect. No other projects, actions, or trends are known that would affect transportation locally, and thus, cumulative impacts would be equal to the direct and indirect impacts from the HGS, which are at most minor.

Farmland and Land Use – Conversion of farmland to industrial land use would have impacts of minor magnitude, long-term (permanent) duration, and medium extent. Impact on land use (property values) from the operation of a power plant at Salem would be of moderate magnitude, long-term duration, medium to large extent, and possible likelihood. The likelihood that the siting of an industrial facility eight miles from Great Falls would attract further development to this area, leading to greater farmland conversion and loss, is not considered great, given the availability of other sites closer to town. Cumulative adverse impacts on farmland and land use would thus be equal to direct and indirect impacts from the HGS, and are deemed to be minor.

Waste Management – Construction impacts on waste management would likely be of minor magnitude, medium-term duration, and small extent. Operation-related impacts on waste management for the Salem Site would be of moderate magnitude, long-term duration, and medium extent. No other projects, actions, or trends are known that would affect waste management locally, and thus, cumulative impacts would be equal to the direct and indirect impacts from the HGS, which would be moderately adverse.

Human Health and Safety – Construction-related impacts on human health and safety would be of minor magnitude, medium-term duration, and small extent. Operation-related impacts on human health and safety would be of minor magnitude, long-term duration, and medium extent. Several other facilities in the area are major sources of air emissions, and modeling presented in Chapter 4 determined that none of these in combination with the HGS would cause exceedances of the NAAQS or the MAAQS. No other projects, actions, or trends are known that would affect human health and safety locally. Thus, cumulative impacts would be equal to the direct and indirect impacts from the HGS, which are at most minor.

Socioeconomics – During the construction phase of the HGS, there would be moderately beneficial effect on the socioeconomic environment of the local and regional area, including increases in employment opportunities, total purchases of goods and services, and an increase in the tax base. During long-term operational phase, beneficial socioeconomic impacts would be of minor magnitude, long-term duration and medium extent. Overall long-term cumulative impacts from the HGS and other recent projects in the area would be of minor magnitude and economically beneficial.

5.5 ALTERNATIVE SITE – INDUSTRIAL PARK

The Alternative Site would also contribute to certain cumulative impacts, which are discussed briefly below and presented in Table 5-4.

Soils, Topography, and Geology – Cumulative impacts would be similar to those related to the Proposed Action. Extensive site grading and excavation activities would disturb a considerable amount of soil and lightly alter topographic contours at the alternate site, and overall, soil resource impacts from construction activities would have a moderate magnitude, medium-term duration, and medium extent. Combined with other construction activities in the Great Falls area and Cascade County, plus general long-term degradation of agricultural lands from water and wind erosion (offset somewhat by setting aside CRP lands) and gradual loss of soil fertility, there

Table 5-4. Summary of the Potential Long-term Cumulative Impacts to which the Alternative Site for SME's Power Plant would Contribute Incrementally

Resource topic	Proposed Action	Other Past, Present and Future Actions	Cumulative Impacts
Soils, Topography, and Geology	*	*	*
Water Resources	*	**	**
Air Quality	*	**	**
Biological Resources	*	*	*
Noise	*	*	**
Recreation	*	*	*
Visual Resources	*	*	*
Transportation	*	*	*
Farmland and Land Use	*	*	*
Waste Management	**	*	**
Human Health & Safety	*	*	*
Socioeconomics	++	+	+
Environmental Justice/Protection of Children	*	*	**

Key:
Adverse: * Minor Impact ** Moderate Impact *** Major Impact
Beneficial: + Minor Impact ++ Moderate Impact +++ Major Impact
No Impact: 0

Impact Intensity Definitions:
Minor – Change in a resource area occurs, but no substantial resource impact results.
Moderate – Noticeable change in a resource occurs, but the integrity of the resource remains intact.
Major – Substantial impact/change in a resource area that is easily defined, noticeable & measurable.

would be an overall minor adverse cumulative impacts on soils from the Alternate Site and connected actions like pipeline and transmission line construction.

Water Resources – Cumulative impacts would be very similar to those related to the Proposed Action. Site construction would involve negligible to minor impacts on receiving water quality from increased storm water runoff and possible contamination. Over the long term, there would

be negligible to minor impacts on Missouri River flows from water withdrawals and consumptive use. Basin-wide water quality and quantity (seasonal flows downstream) on the Missouri will likely continue to be problems in the future, and by using water consumptively, the Proposed Action would contribute incrementally to a negligible to minor degree toward these continuing, cumulative adverse effects.

By releasing some quantity of sulfur dioxide to the atmosphere, any new coal-fired power plant would also contribute incrementally to significant cumulative impacts on the water quality of the nation's water bodies from acid deposition. However, the distance of HGS from areas of the country and continent where acidification is a serious problem, primarily poorly buffered Canadian Shield parent rocks/soils of the Upper Midwest and Northeast – may mean that its SO_2 emissions have limited or negligible impacts on these vulnerable areas. While innovative regulatory tools (cap and trade program) and control technology under the Clean Air Act Amendments of 1990 have made substantial strides in reducing SO_2 emissions nationwide, the significant impacts (e.g. acidified lakes and streams and stressed or eliminated aquatic life, including fish) largely continue to this day and will probably continue for some years to come.

Air Quality – Cumulative impacts would be very similar to those associated with the Proposed Action. In the short-term, there may be slightly greater cumulative air quality effects on local residents from combined emissions and fugitive dust, in conjunction with other ongoing and future development near the Industrial Park. Over the long run, CFB technology and BACT controls would reduce potential power plant air emissions of all criteria pollutants and HAPs, so that SME's plant would not, in and of itself, generate significantly adverse impacts on local and regional air quality. DEQ Air Quality Permit conditions will set so as to prevent the region from being pushed into non-attainment of the NAAQS and MAAQS. Nevertheless, some minor to moderate degradation of ambient air quality would likely occur, and with increasing overall emissions in Montana and neighboring states from a variety of sources, including new and proposed coal-burning power stations, cumulative impacts over the coming decades could become significant.

With air quality more than any other individual resource topic covered in this EIS, potential cumulative impacts from a large number of mobile and stationary sources across a wide geographic domain are the major issue. The Alternative Site, to the same extent as the Salem site, would contribute incrementally to a minor or moderate extent toward cumulative impacts related to regional haze, visibility impairment in Class I areas, mercury dispersion and bioaccumulation, and global climate change.

Noise – Cumulative impacts may be somewhat greater than those related to the Proposed Action. The proposed power plant would cause minor to moderate, short-term adverse impacts from intermittent noise during construction, both from equipment at site and transit of city and county streets by workers and equipment. The power plant would also entail minor long-term impacts from increased noise along route of train carrying coal to power plant. The overall, long-term impact of noise from coal plant operation on receptors would be negligible to minor. Increased traffic, possible widening of U.S.-87, the new IMC plant and possible others at the Industrial Park, and possible continuing residential and commercial development locally would all increase noise. Overall cumulative impacts would likely be moderately adverse but not significant.

Recreation – Cumulative impacts would be similar to those related to the Proposed Action. The Alternative Site would cause negligible to at most minor impacts on recreation in the immediate project vicinity and wider Great Falls area. There are no other past, present, or future planned projects in the area that would adversely impact recreation, so that cumulative impacts would be equal to the direct and indirect impacts from the power plant itself, which are at most minor.

Visual Resources – The Alternative Site would likely result in scenic impacts of moderate magnitude, long-term duration, medium or localized extent. No other projects, actions, or trends are known that would affect visual resources locally, and thus, cumulative impacts would be equal to the minor direct and indirect impacts from the construction and operation of SME's plant at the Industrial Park.

Transportation – Construction-related impacts on road traffic would be of minor magnitude, medium-term duration, and small extent. There would also be minor, temporary construction-related impacts on rail transport on the BNSF line to which a rail spur would connect. The long-term increase of traffic volumes on U.S.-87 running near the Industrial Park site – related to general development in the area, not the proposed SME plant, may be offset by proposed widening of this road. No short-term cumulative impacts are expected, but there could be long-term, minor adverse cumulative impacts on traffic.

Farmland and Land Use – Conversion of farmland soils would have impacts of minor magnitude, long-term (permanent) duration, and medium extent at the Industrial Park site. Impacts on adjacent land uses (especially residential) from the operation of a power plant at the Industrial Park Site would be minor magnitude, long-term duration, medium extent, and possible likelihood. The combination of the IMC plant, SME's plant, and possible future industrial facilities at the Industrial Park site would represent the realization of this site's intended uses, but could have minor adverse cumulative impact on nearby land uses.

Waste Management – Construction impacts on waste management at the Industrial Park would be of minor magnitude, medium-term duration, and small extent. Operation-related impacts on waste management for the Industrial Site would be of minor to moderate magnitude, long-term duration, and small extent. No other projects, actions, or trends are known that would affect waste management locally, and thus, cumulative impacts would be equal to the direct and indirect impacts from the Alternative Site, which would be moderately adverse.

Human Health and Safety – Construction-related impacts on human health and safety would be of minor magnitude, medium-term duration, and small extent. Operation-related impacts on human health and safety would be of minor magnitude, long-term duration, and medium extent. Several other facilities in the area are major sources of air emissions, and modeling presented in Chapter 4 determined that none of these in combination with the HGS would cause exceedances of the NAAQS or the MAAQS. No other projects, actions, or trends are known that would affect human health and safety locally. Thus, cumulative impacts would be equal to the direct and indirect impacts from the HGS, which are at most minor.

Socioeconomics – Cumulative socioeconomic impacts would be very similar to those related to the Proposed Action. During the construction phase of the power plant, there would be

moderately beneficial effect on the socioeconomic environment of the local and regional area, including increases in employment opportunities, total purchases of goods and services, and an increase in the tax base. During long-term operational phase, beneficial socioeconomic impacts would be of minor magnitude, long-term duration and medium extent. Overall long-term cumulative impacts from the SME power plant and other recent projects in the area would be of minor magnitude and economically beneficial.

Environmental Justice and Protection of Children – Impacts of plant operation at the Industrial Park site on low-income residents would be of minor to moderate magnitude, long-term duration, medium extent, and unlikely likelihood. Emissions from the proposed plant could be compounded by other industrial emissions in the vicinity, if the Industrial Park further develops, which could potentially place an undue burden of air pollutants on residents downwind of the facilities, particularly children, and if present, low-income residents. Additional air modeling would be required in order to determine if this risk does actually exist. Thus, cumulative impacts could be minor to moderately adverse.